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EXAMINER	
WYATT, KEVIN S	
ART UNIT	PAPER NUMBER
2878	

DATE MAILED: 10/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

EK

Office Action Summary	Application No.	Applicant(s)	
	10/700,794	WEST ET AL.	
	Examiner	Art Unit	
	Kevin Wyatt	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 August 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) *27-29* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 9-26* is/are rejected.

7)☒ Claim(s) *8* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 November 2003 and 16 May 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group II (claims 27-29) in the reply filed on 8/15/2005 is acknowledged.

2. Claims 27-29 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 8/15/2005.

Information Disclosure Statement

3. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Drawings

4. Figures 1 and 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct

any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

5. Claims 14-17 and 22-24 are objected to because of the following informalities:

In claims 14-17 and 22-24, line 1, "The scanning force microscope" should be changed to "The scanning probe microscope" for consistency.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 3, 5, 7, 20, and 25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

8. Regarding claims 3, 5, and 7, use of the term "quartz crystal cross oscillator" is not clearly defined and its intended meaning is unclear. Further explanation of this term is needed.

9. The term "small" in claims 20 and 25 is a relative term which renders the claim indefinite. The term "small" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the

art would not be reasonably apprised of the scope of the invention. Further clarification of this term is needed.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 1-2, 4, 6, 9-10, and 12-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Tomita (U.S. Patent No. 6,201,227 B1).

Regarding claim 1, Tomita shows in Figs.1 and 5-6, a scanning probe microscope for imaging the surface of a sample, comprising: a sensor (vibration–detecting portion consisting of a quartz oscillator (4), coarse displacement means (6), z-fine displacement element (11)) comprising an oscillator for producing a signal; a probe (1) connected to the sensor; an optical microscope (Fig. 5, i.e., scanning probe microscope (col. 5, lines 39-42)); means for scanning the probe (combination of XY fine displacement element (13) and XY scanning circuit (14), col. 3, lines 20-22) with respect to the sample; sensor electronics (combination of current/voltage amplifier (5), z servo circuit (12)) connected to the sensor for monitoring the signal produced by the sensor (col. 5, lines 45-48); and means responsive to the signal produced by the sensor

electronics (6, i.e., course displacement means) for moving the probe toward or away from the surface of the sample (col. 6, lines 30-33).

Regarding claim 2, Tomita discloses that the oscillator (4, i.e., quartz oscillator) is a resonant crystal oscillator (col. 4, lines 9-11).

Regarding claim 4, Tomita provides a resonant crystal oscillator that is self-excited (i.e., requires no input voltage for oscillations).

Regarding claim 6, Tomita shows in Fig. 1 an external modulator (combination of piezoelectric oscillator (2), quartz oscillator holder (25), XY fine displacement (13), and Z fine displacement (11)) is provided proximate to the resonant crystal oscillator, and further comprising an excitation circuit for supplying an excitation signal to drive the modulator (col. 4, lines 3-9 and 57-58).

Regarding claim 9, Tomita discloses a scanning probe microscope comprising a holder for the sensor that facilitates rapid probe exchange (col. 3, lines 51-57).

Regarding claim 10, Tomita discloses that the oscillator is operated at substantially its resonance frequency (col. 4 lines 9-11).

Regarding claim 12, Tomita discloses that the oscillator operates in a shear force mode by vibrating the probe approximately parallel to the surface of a sample (col. 3, lines 27-28).

Regarding claim 13, Tomita discloses a cantilever (cantilever spring extending from the resilient body (16)) and wherein the probe is mounted to the cantilever and the cantilever is in turn mounted to the sensor to connect the probe to the sensor (col. 4, lines 24-25 and 41-43).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. Claims 3, 5 and 7, are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita (U.S. Patent No. 6,201,227 B1) in view of Terasawa (JP 2000083976 A). Insofar as understood.

Regarding claims 3 and 5, Tomita discloses the claimed invention as stated above. Tomita does not disclose that the resonant crystal oscillator is a quartz crystal cross oscillator that is self-excited. Terasawa shows in Figs. 5-7 a cross crystal oscillator (25) is self-excited (i.e., requires no input voltage for oscillations). It would have been obvious to one skilled in the art to provide the cross crystal oscillator of Terasawa to the device of Tomita for the purpose of improving heat dissipation during oscillation.

Regarding claim 7, Tomita discloses the claimed invention as stated above. Tomita does not disclose an external modulator provided proximate to a quartz crystal cross oscillator. Terasawa shows in Figs. 5-7 a cross crystal oscillator (25). It would have been obvious to one skilled in the art to provide the cross crystal oscillator of Terasawa to the device of Tomita for the purpose of improving heat dissipation during oscillation.

14. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita (U.S. Patent No. 6,201,227 B1).

Regarding claim 11,Tomita discloses the claim invention as stated above. Tomita does not disclose a scanning probe microscope wherein the resonance frequency is greater than 400 kHz. It has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum measurements involves only routine skill in the art. It would have been obvious to one skilled in the art to provide a crystal oscillator having a resonant frequency greater than 400 kHz for the purpose of providing a better resolution of three-dimensional image.

15. Claims 14-15,18-22, and 25-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita (U.S. Patent No. 6,201,227 B1) in view of Chen (U.S. Patent No. 6,169,281).

Regarding claim 14, Tomita discloses the claimed invention as stated above. Tomita does not disclose that the means for scanning the probe with respect to the sample comprises a first electromechanical transducer and a second electromechanical transducer, the first electromechanical transducer having a first resonant frequency and the second electromechanical transducer having a second resonant frequency substantially lower than the first resonant frequency, and wherein the means responsive to the signal produced by the sensor electronics for moving the probe toward or away from the surface of the sample comprises a third electromechanical transducer having a third resonant frequency substantially higher than the first resonant frequency. Chen shows in Fig. 8, that the means for scanning the probe with respect to the sample

comprises a first electromechanical transducer (162 and 164, i.e., -X electrode and +X electrode), the first electromechanical transducer having a first resonant frequency (col.15, lines 34-36), and the second electromechanical transducer (172 and 174, i.e., -Y electrode and +Y electrode) having a second resonant frequency (col.15, lines 36-37) substantially lower than the first resonant frequency, and wherein the means responsive to the signal produced by the sensor electronics for moving the probe toward or away from the surface of the sample comprises a third electromechanical transducer (184, i.e., excitation electrode) having a third resonant frequency substantially higher than the first resonant frequency (col. 15, lines 37-40). It would have been obvious to one skilled in the art to provide the first, second and third electromechanical transducers of Chen to the device of Tomita for the purpose of providing a high response to a wide range of voltage signals.

Regarding claims 15 and 22, Tomita discloses the claimed invention as stated above. Tomita does not disclose the first electromechanical transducer scans in an X direction and has a resonant frequency R(X), the second electromechanical transducer scans in a Y direction and has a resonant frequency R(Y), and the third electromechanical transducer scans in a Z direction and has a resonant frequency R(Z), and R(Z) >> R(X) >> R(Y). Chen discloses that the first electromechanical transducer scans in an X direction and has a resonant frequency R(X), the second electromechanical transducer scans in a Y direction and has a resonant frequency R(Y), and the third electromechanical transducer scans in a Z direction and has a resonant frequency R(Z), and R(Z) >> R(X) >> R(Y) (col. 15, lines 37-40 and 60-61). It would

have been obvious to one skilled in the art to provide the first, second and third electromechanical transducers of Chen to the device of Tomita for the purpose of obtaining a high response to a wide range of voltage signals.

Regarding claim 18, Tomita discloses the claimed invention as stated above. Tomita does not disclose that the means responsive to the signal produced by the sensor electronics for moving the probe toward or away from the surface of the sample comprises a first feedback loop for producing a first control signal, a first electromechanical transducer having a first resonant frequency, a second feedback loop for producing a second control signal, and a second electromechanical transducer having a second resonant frequency, the first resonant frequency being lower than the second resonant frequency. Chen shows in Figs. 8-9, that the means responsive to the signal produced by the sensor electronics for moving the probe toward or away from the surface of the sample comprises a first feedback loop (a laser detector (138), band pass filter (244), x demodulator (243), ADC (250), computing system (144), DAC (193), amp (192), X-axis driver (118)) for producing a first control signal (col. 6, lines 21-22), a first electromechanical transducer (162 and 164, i.e., X-electrodes) having a first resonant frequency, a second feedback loop (a laser detector (138), band pass filter (140), z demodulator (141), comparison circuit (142), integrator (148), ADC (149) computing system (144), DAC (154), Z-axis driver (126)) for producing a second control signal (col. 6, lines 24-25), and a second electromechanical transducer (184, i.e., excitation electrode) having a second resonant frequency, the first resonant frequency being lower than the second resonant frequency (col. 6, lines 20-25). It would have been obvious to

one skilled in the art to provide the first, second and third electromechanical transducers of Chen comprising feedback loops to the device of Tomita for the purpose of providing greater control of tip motion.

Regarding claim 19, Tomita discloses the claimed invention as stated above. Tomita does not disclose a scanning probe microscope according to claim 18, wherein the first electromechanical transducer is employed to level the surface of the sample with respect to the sensor, whereby a range of motion imparted by the second electromechanical transducer to the probe is small. Chen discloses that the first electromechanical transducer is employed to level the surface of the sample with respect to the sensor, whereby a range of motion imparted by the second electromechanical transducer (184, i.e., excitation electrode) to the probe is small (col. 8, lines 13-24). It would have been obvious to one skilled in the art to provide the first and second transducers of Chen to the device of Tomita, having a small range of motion for the purpose of maintaining stability of tip motion.

Regarding claims 20 and 25, insofar as understood, Tomita discloses the claimed invention as stated above. Tomita does not that the motions imparted by the first and second electromechanical transducers to the probe are orthogonal to the motion imparted to the probe by the third electromechanical transducer, whereby a range of motion imparted by the third electromechanical transducer to the probe is small. Chen shows in Fig. 8, that the motions imparted by the first and second electromechanical transducers to the probe are orthogonal to the motion imparted to the probe by the third electromechanical transducer (col. 6, lines 55-58), whereby a range

of motion imparted by the third electromechanical transducer to the probe is small (Figs. 10-11). It would have been obvious to one skilled in the art to provide the provide the first, second and third electromechanical transducers of Chen to the device of Tomita where motions of the first and second electromechanical transducers are orthogonal to the third transducer for the purpose of generating a tip motion that results in a signal producing a three dimensional image.

Regarding claim 21, Tomita shows in Figs.1 and 5-6, a scanning probe microscope for imaging the surface of a sample, comprising: a) a sensor (vibration–detecting portion consisting of a quartz oscillator (4), coarse displacement means (6), z-fine displacement element (11)) comprising an oscillator for producing a signal, a probe (1) connected to the sensor, and c) sensor electronics (combination of current/voltage amplifier (5), z servo circuit (12)) connected to the sensor for monitoring the signal produced by the sensor (col. 5, lines 45-48). Tomita does not disclose a means for scanning the probe with respect to the sample comprising a first electromechanical transducer and a second electromechanical transducer, the first electromechanical transducer having a first resonant frequency and the second electromechanical transducer having a second resonant frequency substantially lower than the first resonant frequency; and means responsive to the signal produced by the sensor electronics for moving the probe toward or away from the surface of the sample comprising a third electromechanical transducer having a third resonant frequency substantially higher than the first resonant frequency. Chen shows in Fig. 8 a means for scanning the probe with respect to the sample comprising a first electromechanical

transducer (162 and 164, i.e., -X electrode and +X electrode) and a second electromechanical transducer (172 and 174, i.e., -Y electrode and +Y electrode), the first electromechanical transducer having a first resonant frequency and the second electromechanical transducer having a second resonant frequency substantially lower than the first resonant frequency (col.15, lines 34-37); and means responsive to the signal produced by the sensor electronics for moving the probe toward or away from the surface of the sample comprising a third electromechanical transducer (184, i.e., excitation electrode) having a third resonant frequency substantially higher than the first resonant frequency (col.15, lines 34-40). It would have been obvious to one skilled in the art to provide the first second and third electromechanical transducers of Chen to the device of Tomita for the purpose of obtaining a high response to a wide range of voltage signals.

Regarding claim 26, Tomita discloses the claimed invention as stated above. In addition, Tomita shows in Fig. 5, that the scanning probe microscope comprises an optical microscope (combination of mirror (23), optical window (24), lens (8), half-mirror (31) and camera (29)) for viewing the location of the probe mounted to the sensor. Tomita does not disclose scanning probe microscope for imaging the surface of a sample, comprising: means for scanning the probe with respect to the sample comprising a first electromechanical transducer and a second electromechanical transducer, the first electromechanical transducer having a first resonant frequency and the second electromechanical transducer having a second resonant frequency substantially lower than the first resonant frequency; and means responsive to the

signal produced by the sensor electronics for moving the probe toward or away from the surface of the sample comprising a third electromechanical transducer having a third resonant frequency substantially higher than the first resonant frequency. Chen shows in Figs. 8 and 12, a scanning probe microscope for imaging the surface of a sample comprising: a means for scanning the probe with respect to the sample comprising a first electromechanical transducer (162 and 164, i.e., -X electrode and +X electrode) and a second electromechanical transducer (172 and 174, i.e., Y-electrodes), a first electromechanical transducer having a first resonant frequency (col.15, lines 34-36) and a second electromechanical transducer having a second resonant frequency (col.15, lines 36-37) substantially lower than the first resonant frequency (col. 15, lines 60-61); and means responsive to the signal produced by the sensor electronics for moving the probe toward or away from the surface of the sample comprising a third electromechanical transducer (112, i.e., piezoelectric actuator) having a third resonant frequency (an excitation frequency derived from excitation oscillator (36), col. 15, lines 32-34) substantially higher than the first resonant frequency (col. 15, lines 37-40). It would have been obvious to one skilled in the art to provide the quartz oscillator of Tomita to the device of Chen for the purpose of obtaining a high response to a wide range of voltage signals.

16. Claims 16 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita (U.S. Patent No. 6,201,227 B1) in view of Chen (U.S. Patent No. 6,169,281) and Furukawa (U.S. Patent No. 6,207,069 B1).

Regarding claims 16 and 23, Tomita discloses the claimed invention as stated above. Tomita does not disclose that the electromechanical transducers that are piezoelectric ceramic actuators. Furukawa shows in Figs. 1-3 a ceramic piezoelectric actuator. It would have been obvious to one skilled in the art provide the ceramic piezoelectric actuator of Furukawa to the device of Tomita for the purpose of producing the piezoelectric actuator at a lower cost.

17. Claims 17 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomita (U.S. Patent No. 6,201,227 B1) in view of Chen (U.S. Patent No. 6,169,281), Furukawa (U.S. Patent No. 6,207,069 B1) and Normen (U.S. Patent No. 6,577,977 B2).

Regarding claim 17 and 24, Tomita discloses the claimed invention as stated above. Tomita does not disclose that the first electromechanical transducer is a voice coil and the second and third electromechanical transducers are piezoelectric ceramic actuators. Furukawa shows in Figs. 1-3 a piezoelectric actuator and Normen Fig. 6, a transducer comprising a voice coil. It would have been obvious to provide the transducer of Normen and the piezoelectric actuator of Furukawa to the device of Tomita for the purpose of providing low cost, overall performance.

Allowable Subject Matter

18. Claim 8 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

19. The following is a statement of reasons for the indication of allowable subject matter:

Claim 8 is allowable because the prior art fails to disclose or make obvious, either singly or in combination, a scanning probe microscope, comprising, in addition to the other recited features of the claim, a scanning probe microscope operable in a mode selected from the modes of magnetic force microscopy and electrostatic force microscopy and the signal produced by the sensor is used to determine characteristics of the sample selected from among the characteristics of magnetic and electrostatic properties, respectively.

Conclusion

20. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kitamura (U.S. Patent No. 5,939,715) discloses a scanning probe microscope.

Morimoto (U.S. Patent No. 5,965,881) discloses a scanning probe microscope and processing apparatus.

Minnie (U.S. Patent No. 6,075,585) discloses a vibrating probe for scanning probe microscope.

Muramatsu (U.S. Patent No. 6,239,426 B1) discloses a scanning probe and scanning probe microscope.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Wyatt whose telephone number is (571)-272-5974. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dave Porta can be reached on (571)-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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